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SECTION V

THERAPEUTICS

INDEPENDENT PAPER

Ueberreicht vom Verfasser

THE HEART MASSAGE

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The various conditions at work when cardiac failure arises emphasize the importance of their recognition in order that appropriate treatment may be pursued.

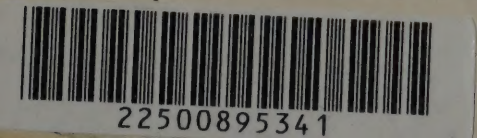
I will not occupy your precious time with the discussion of the conditions which produce heart failure, as this question was very well elucidated by Professor Sir Clifford Allbutt in the Chelsea Clinical Society. I cannot, however, agree with the opinion that the site of the lesions does not give very much help, or with the opinion of Dr. Hector Mackenzie that 'the clinical recognition of the structural changes of the heart is impossible in the absence of symptoms and physical signs': these symptoms and signs are usually present, but their character is not that of the routine type and deserves special investigations; indeed, my study of the method of localization of the processes in the heart muscle during the last fourteen years has shown me that here we can find the key to many mysterious cases of sudden death, and the fact quoted by Sir Clifford Allbutt that 'fibrosis of myocardium is not infrequently found in hearts which have been quite efficient during life' shows the necessity of a more complete investigation of such cases. Sudden death was, for instance, observed by me in from 33 to 50 per cent. of the cases of syphilitic myocarditis, where by the careful examination of the patients the nature of their diseases could have been discovered, and the fatal result prevented.

I can only congratulate Dr. William Eward and Dr. Hector Mackenzie for their opinion on the mechanical risk of gastro-intestinal distension, which, although it is only one of many, is not the least frequent or the least potent of factors in the etiology of unexplained cardiac failure.

A very important group of heart failure, besides syncope, is that which concerns surgical shock and collapse. You know the very conflicting ideas on this subject of Dr. J. P. Lockhart Mummery and of Dr. J. D. Malcolm. Dr. Mummery maintains that the lowered arterial blood-pressure which occurs in shock is due to a dilatation of arterioles throughout the body; Dr. Malcolm on the other side upholds the view that in shock there is a contraction of arterioles throughout the body; each of them gives, conse-

BREITMANN

quently, different modes of the treatment of the named conditions. It seems to me that in this discussion the fundamental law of physiology was forgotten; that is, the law of Pflüger-Arndt, that in the case of a healthy nerve or muscle very feeble irritations which do not reach the 'threshold' have no effect at all, feeble ones increase the activity, middle ones strengthen the same, the strong ones inhibit, and the strongest paralyse or depress the whole activity. In the case of disease, according to the law of Woltzendorff the scale of irritability is displaced in the direction of a greater susceptibility, and the irritation, which is feeble for a healthy nerve or muscle, in a pathological instance can produce an effect corresponding to a stronger irritation, with the result that instead of stimulation of the tissues an unexpected depression or inhibition takes place. Nearly the same is the case with shock; at first all impulses are vaso-constrictor in nature, but this effect is the more quickly exhausted, and gives place to depressor impulses or vaso-dilatation, perhaps also to a retraction in the sense of Dr. William Sheen. According to the different condition of the blood-vessels ('the peripheric heart') of the heart itself and of the central nervous system the clinical picture will be different in various cases, which sufficiently explains also the discrepancy in the observations and conclusions of eminent physicians, who cannot agree only because they have seen different stages of the process. When recovery takes place, the central heart, the peripheric heart (the blood-vessels), and the central nervous system gradually return from their exhaustion to their normal conditions. It would perhaps be useful to discriminate between collapse, a temporary accident of a direct depression of the vasomotor centres, in which the patient is capable of being revived by ordinary clinical means, and the shock where there is a preceding exhaustion of the centres and which, if it terminates fatally, destroys life as a rule within twenty-four hours (Lockhart Mummery, Walscheid). In the actual treatment of heart failure, shock, and collapse measures advocated for the resuscitation are: the inversion of the patient to any of the suitable positions, artificial respiration, warmth, inhalations of oxygen, injections of saline solutions, adrenalin, pituitary extract, bandaging the limbs, pressure on the abdomen or on the aorta, friction and counter-irritations, as mustard, capsicum, &c, and—last not least—rhythmic kneading of the heart muscle through the abdominal section. All these measures are good as far as they can serve to restore the respiration, the body temperature, and the circulation, which is not merely a question of the central or cardiac maintenance of blood-pressure, but to a large extent due to the lack of influence of the vasomotor system. The application of warmth, for example, exercises a beneficial influence in the treatment of shock, partly because it helps to restore the circulation of the blood, partly because it tends to prevent undue loss of heat from the surface of the body. Dr. Malcolm is quite right in mentioning that friction of the surface and the application of rubefacients, such as mustard, are powerful remedies of great value. He was taught by the late Mr. Knowsley that rubbing the lips was a very efficient agent in improving the circulation when a patient is suffering from the combined effects of a severe operation and of chloroform anæsthesia.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The compression of the abdomen raises the relative pressure by driving the blood from the dilated splanchnic vessels into the more important areas of the head and chest.

As Dr. Vivian B. Orr says, the inadequacy of the usual methods of restoring life in cases of heart failure under anæsthetics seems undeniable, while the claims of massage appear to be clearly established. He believes that the sub-diaphragmatic route is the preferable method of reaching the heart; many successful cases have been reported resulting from this procedure; some of them exhibited a return of circulation and respiration for some hours, with no return of consciousness and ultimate death. If massage were performed within five minutes of the heart arrest there was a reasonable prospect of a favourable result, if efficient lung aeration were maintained. Valuable time was often lost in futile administration of different routine remedies. Dr. Dudley W. Buxton also believes that the abdominal route without incision into the diaphragm is the best one for heart massage, and he contends that the measure should not be unduly delayed if the case were at all appropriate, as the surgical procedure involved does not increase the patient's risk seriously. R. A. Fleming thinks that massage gives tone to the heart where it is possible for the myocardium to respond at all, and it probably does so by dilating the vessels and relieving the overburdened heart.

Notwithstanding good results of which the surgeons boast from the sub-diaphragmatic massage, I find this measure just a little bit too severe, and indicated only perhaps in the most desperate cases of the surgical operations. As a therapist I do not see such desperate surgical cases, but I see very often cases of heavy syncopes, shocks, and collapses from internal causes, especially from serious vasomotor disturbances, from the different heart affections, e. g. where the compensation begins to fail, in cases of dilatation of the heart, in severe heart neuroses, fat-heart, angina pectoris, &c. Besides the usual measures which are of avail in these cases, I have used for seven years a method of heart massage in which there is no need to open any cavity of the body, and which develops its activity through the nervous system and the heart muscle itself. I would call this method in my present paper 'vibration massage of the heart', but I fear that it would lead, as it has already, to a false manner of using it which depends on a quite wrong conception of the physiological action of the vibrations.

The vibrations are divided according to their amplitude into: vibrations *sensu stricto*, concussions, succussions, propulsions, &c. The concussions, which have the largest amplitude, and which must not be executed more than a thousand times in a minute, perhaps even in a lesser quantity with better results, have first a purely mechanical effect on the organism and are propagated more by continuity than by contiguity, with the result that the application to a definite organ has a localized and more pronounced action on the same than on the neighbour organs. In the case when the vibrations become more frequent, i. e. when they reach the quantity of 2,000 and more in a minute, their mechanical effect diminishes in the same proportion as the physiological effect develops its full validity.

But as this quantity grows more and more, the curve of the vibrations, which in the case of concussions gives infrequent but strong and high waves, shows a gradual diminution of amplitude of every wave, and the wave curve tends to approach a straight line, in which case, of course, the action of the vibrations is so minute that it tends to approach to a zero. That was the case with the investigations of E. Plate and A. Bornstein, who in the search for higher and higher frequency of vibrations have reached 18,400, but their own investigations have shown that such an excessive amount of vibrations in a minute have had no influence on the quantity of the blood thrown out by the heart in a minute's time. This result did not astonish me at all, and Dr. Plate himself says on page 30 of his article: 'Es zeigte sich nun, dass die Erschütterungen milder empfunden wurden, je höher ihre Zahl steigt, vielleicht weil so schnell aufeinanderfolgende Reize von unseren Nerven weniger gut wahrgenommen werden,' which is the same as saying that these irritations have almost no physiological action at all. Not only does the 'minute's time volume' of the heart remain without any change, but there is nothing to gain from such a method in cases where a rapid effect on the heart and the blood-vessels is not only desirable, but indispensable.

The chief thing is to find such a method of influencing the heart and the blood-vessels as would be of value even in severe cases of syncope, shock, and collapse, surgical and therapeutic. This method consists first in friction of the skin, and especially in rhythmically striking the back between the scapulas or in the region of the seventh cervical vertebra. The last is now the method empirically practised by Japanese experts in jiu-jitsu for restoring to consciousness those rendered temporarily insensible by these movements, as well as in sunstroke, in the treatment of the apparently drowned, &c. According to Abrams there are various ways of performing Kuatsu, that usually seen amongst coolies on board ship in the Far East being to prop the patient up, stand behind him, grasp his head between the hands, and strike his seventh cervical vertebra rhythmically with the operator's right knee. The method, however, used by the Kano School, and sanctioned by the Japanese Government, is to lay the patient prone, with arms extended at right angles to the body, and for the operator to kneel over him and then rhythmically strike his seventh cervical spine with the butt of his palm, wrist extended, until consciousness returns. He is then propped up, and his arms worked in a circle, after which he is helped on his feet, and induced with help to walk about in order to stimulate respiration and circulation, it having been found otherwise that he is liable to lapse into unconsciousness again and die.

The same method of reviving can be carried out in an easier and more precise manner with the help of a good vibration apparatus, the advantage of which would be, first, the possibility of a far larger range of strength, and secondly, the indefatigability of the apparatus when compared with the hand; in the third place, it can be executed not only by striking the seventh cervical vertebra, but also, and perhaps with better and more agreeable results for the patient, between the scapulas on the left side or on the region of the heart itself from in front. Abrams explains the frequent efficacy of the

proceeding by stating that it is the most certain method known of stimulating the heart reflex, i.e. a contraction of the myocardium of varying duration. The contraction is easily seen by means of the Röntgen rays, and may be mapped out by careful percussion of the area of cardiac dullness. It involves both ventricles, especially the left, after cutaneous irritation, and persists for some little time after the cessation of stimuli in normal hearts, and may be present for some hours afterwards in cases of cardiectasis. Previous injections of pilocarpine increase the sensitiveness of the reflex. Abrams found when X-ray photographs were taken before and after one case that without pilocarpine there was a contraction of the shadow outline of from 1 to 2 centimetres, whereas thirty minutes after the injection of a tenth of a grain of pilocarpine on stimulation the shadow contracted from 2 to 7 centimetres. The reflex, he states, can be elicited from various surfaces on the body, but experimentally the most effective site and method, he found, was when the seventh cervical spine was percussed. Exercises and baths will produce the reflex, and to this he attributes the success of the Schott treatment, affirming, however, that 'more can be done in a few days by eliciting the heart reflex in cardiac insufficiency' by the Kuatsu method 'than by months of the conventional Schott treatment'. In cases of acute infective disease with accompanying heart failure he also advocates its use, relating his results with a lady suffering from apical pneumonia accompanied by heart failure.

If the observations of Abrams are right, his explanation of them can be contested, and, as was pointed out in an editorial in *The Lancet*, the spine of the seventh cervical vertebra corresponds to the third dorsal segment of the cord and to the third dorsal nerve which sends a large branch to the inferior cervical ganglion, from which the augmentor fibres of the cardiac plexus are derived. It is probably stimulation of these, and not of the vagus, as Abrams suggests, that increases the force of cardiac contraction and tonicity. The concussion with a small hammer has been also found a *very* effective method (not the *most* effective), and it seems probable that, after all, the habit of smacking coughing cyanotic people on the back may have physiological as well as time immemorial sanction.

If the smacking or concussion is executed otherwise than from the back, then there is no doubt that the vagus is in play. Whether its excitation be produced directly through the concussion of the medulla oblongata, or in the reflex way from the skin nerves, or through the contraction of the peripheric vessels, including the vessels of the lungs, with the following diminution of the respiratory surface of the lungs, the diminished excretion of the carbonic acid, and the irritation of the vasomotor centre, the vagus irritation produces the retardation of the pulse and other symptoms usual in this case and similar to the digitalis action ('the mechanical digitalis'). The fact very well known from literature and very often observed by myself, that the vibrations diminish the area of the heart in cases of its dilatation (even the ordinary clinical percussion of the heart for diagnostic purposes diminishes its dimensions, as was a short time ago demonstrated in a most brilliant way by

Professor Heitler of Vienna), shows that the heart muscle itself in the same way as other muscles is induced to contract by mechanical irritation. By applying them locally to the heart muscle as an experiment, we can produce local irritations and changes in the heart activity; the vibratory application from outside, as in cases of non-surgical massage of the heart, has without any doubt a very beneficial effect on the heart activity in the same sense as it is produced by digitalis and other cardiac remedies, i. e. in the sense of retardation of the cardiac action, of the regulation of its contractions, of the more complete filling of the heart cavities with blood during the systole, and the more complete restoration during the diastole. There is no doubt that the vibration also regulates the co-ordination of the different muscle and nerve elements of the heart and removes disturbance of the functions of the heart muscle, by amelioration of the conductibility of the atrio-ventricular bundle, by vicarious substitution of one part of the heart by another.[1] That the reflex, in this case, does not play such an important rôle as the trophic action on the heart itself, is shown by the everyday observation that the action on the heart activity can be elicited very easily from the left half of the chest, but with very small effect from the right side.

The very beneficial influence of the vibrations on the heart activity is already very well known in literature, and it can also be demonstrated by the sphygmogram, by the electro-cardiogram (of which I give here some interesting instances), and by the Röntgen rays. The Riva-Rocci apparatus shows that vibrations in the beginning of their application produce a contraction of the corresponding blood-vessels with a more or less pronounced rise of blood-pressure. The effect is greater after concussion than after vibratory friction, but in this case it is also of shorter duration; after the combination of both this rise remains longest.

During the same time the respiration becomes slower and deeper. The effect of abdominal vibration deserves a special description. The abdomen is sometimes called the 'accessory heart', and the massage of the abdomen is indeed the indirect massage of the heart: in this case the depletion of the venous vessels is increased, and the work of the heart relieved; the concussions are transmitted up to the heart through the diaphragm and the breast walls; finally, there is a reflex action. The experiments of Stapfer show that a feeble massage of the abdomen is capable of producing contractions of the heart, even in a dying animal, but a strong knocking, according to Goltz, has not such an effect. Therefore the massage of the abdomen can be regarded as a 'vasocardiac tonic remedy'. Cautru, Huchard, and Colombo have found that the massage of the abdomen has a diuretic action like digitalis ('.the digitalis of the fingers'). The final result of abdominal massage varies according to different combinations with other forms of vibrations. A similar but a feebler reflex action on the heart is observed from the internal massage of the nose and of the genital sphere in women.

[1] *Berliner klinische Wochenschrift*, 1911, No. 39. — *Vibratory Massage* (a large text-book which I have published in Russian).

The technic of the heart massage is as follows: I begin with a soft applicator, with which I make slight stroking of the 4 to 6 intercostal spaces and of the neck, especially along the large veins in the direction towards the heart; then with a heart applicator, which consists of a gum hemisphere, I make concussions either in the region of the heart itself or, even with better results, from the back between the left scapula and the spine; in both cases the action on the heart is a very clear one. The handle of the applicator remains in a position which is perpendicular to the chest, tangential to it, or is held inclined to it at an angle of 45°. The most important but technically the most difficult thing is to keep the handle in such an elastic position of the hand that the power lines of the applicator (which I have particularly studied by observing the reflecting flashes of light on the metallic parts of the vibrating surface of the apparatus) would make a figure similar to an eight or to a German 'Kringel' or 'Bretzel'. It must be said that not every vibration is good for this purpose, and that in many cases, when working with a bad machine, the results could only bring the method into discredit. In very sensitive patents the massage must be executed with a very slight degree of vibrations or indirectly through a cushion, through a layer of cotton-wool, &c. In cases of shock, collapse, syncope, &c., besides the methods described, the knocking of the seventh cervical vertebra, the frictions of the palms and of the plantæ pedis can be used with very great success. In general, the massage of the heart ought to be used, even by a physician, only after he has studied the simpler applications of this method, say, to the extremities. We cannot use for massage of the heart apparatuses which are set in action directly with the hand or with the foot, because their working is not uniform, and the use of the heart massage by an uninitiated person is inadmissible.

The massage of the heart is executed generally during five to eight minutes with the patient in a sitting position, in which the heart is nearer to the chest wall; the pulse must be counted during the whole time. The sessions are held in the beginning of the treatment every day, then every second day, up to ten or fifteen times. It is very important to avoid sudden irregularities in the work of the apparatus, because they may cause unforeseen complications.

In many patients with tachycardia paroxysmalis, neurasthenia, hysteria, &c., typical pain-points can be observed in a subjective and in an objective way, especially in the fourth to the seventh intercostal spaces, where the ribs are situated nearer to one another and are 'overburdened', thanks to the attachment of many strong muscles. In cases of tachycardia this place suffers severe succussions from the heart itself with the following irritation; that is also the general place of the venous stasis, of the 'caput Medusæ', &c. In this case vibrations regulate the heart action, produce a retardation of it, have a calming influence, diminish the venous stasis, and relieve the pain-points; for this purpose the anæsthetic qualities of the vibrations are specially useful. As the vibrations have an effect which is very similar to that of digitalis, their use is very desirable in cases where we wish to make an interruption in the administration of the digitalis or to postpone it as much as possible.

Therefore the heart massage is indicated in all those cases where we use cardiac remedies, that is, in almost all diseases of the heart where the circulation is defective; in functional disorders the results are better than in organic, and, in the last, better in cases where the changes are of less degree. Of course, there are also cases where the vibrations are contra-indicated, and where a complete rest is the chief method of treatment: the last degrees of destroyed compensation, severe cases of angina pectoris (in slight cases vibrations are of very great use), aneurysmas of the aorta, inclination to thrombosis, embolies, infarcts of the lungs, hæmoptysis, nephritic affections with œdemas and hydrops, as well as all the cases in which the patients feel worse after the application of the vibrations. In anæmic murmurs of the heart the vibrations can also have a diagnostic significance, because they can remove in many cases anorganic murmurs, if they depend upon a flaccid condition of the heart muscle. The best results have been seen by me in cases of paroxysmal tachycardia, in cases of dilatation and hypertrophy of the heart, in vitia cordis, in fat-heart, syphilitic myocarditis, angiospasms, Graves's disease, and 'struma-heart', asphyxia neonatorum (in my two very severe cases it was necessary to apply the vibrations in the same rhythm as the artificial respiration was executed, in one case during more than one hour, in another more than three hours), in syncopes, shock, and collapse, according to indications given above. The further study of the action of the heart massage would lead to more precise indications for or against the use of it, and would also be of great value for further scientific research, from both physiological and clinical points of view.

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